National Park Service
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Natural Resource Program Center

Blue Ridge Parkway Annual Climate Summary for 2007

Natural Resource Data Series NPS/APHN/NRDS—2010/034

ON THE COVER
Overlook near Water Rock Knob
Photograph by David Barlow, Retired BLRI Ranger

Blue Ridge Parkway Annual Climate Summary for 2007

Natural Resource Data Series NPS/APHN/NRDS—2010/034

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Glossary

Climatological Normal - The prevailing set of weather conditions calculated over a 30-year period, presently 1971-2000. Note that the climatological normal taken over different periods of time (30 years, 1000 years) may be different (NOAA 2008).
COOP- Citizen Operated Weather Station
RAWS- Remote Automated Weather Station

Abstract

The climate in BLRI for 2007 reflected both local scale climatological disturbances, and the larger synoptic climatic signal experienced by the southeastern United States. Above average temperatures for NC occurred in March and August with a below average February and April, however, the **well-below** average precipitation was the bigger concern for resource managers and park resources. In addition, the park experienced extended periods without rain. Average annual precipitation was very low for Mt. Mitchell at 57.68 inches (-16.82 inches, 77.4% of average), with 74.5 in. being average for the Climatological Normal. The 2007 average annual precipitation at Blowing Rock was also very low, at 44.50 inches (-23.45 inches, 65.5% of average) with 67.95 in. being average for the Climatological Normal. Other stations summarized by the report for 2007 also showed less than average yearly precipitation, though Virginia stations displayed only 7 to 13 inches below average compared with extremes in NC approaching 24 inches below average for Blowing Rock. The average annual temperature for 2007 for the Laurel Springs RAWS Station was 1.1 °F warmer (56.8 °F) than the 6-year average for the life of the station (55.7 °F), with the summer months exhibiting temperatures well above average. The same pattern held true for the Blowing Rock and Roanoke stations, with the mean annual temperature exceeding the 30-year Climatological Normal for 1971-2000 by 1.3 and 3.0 °F, respectively

Introduction

The Blue Ridge Parkway (BLRI) contains a 469 mile motor road that connects Shenandoah and Great Smoky Mountains National Parks. Over 82,000 acres and over 1000 perimeter miles contain valuable cultural and natural resources that make BLRI one of the most visited units in the National Park System. The BLRI vicinity contains a substantial gradient of weather conditions depending on elevation and rain shadow locations; for example Richland Balsam, on the Parkway, averages 83 inches of precipitation while the Asheville Regional Airport, less than 25 miles away, averages 47 inches a year. With the exception of Great Smoky Mountains National Park, few other Park Service management units in the eastern United States have as varied climatic conditions (Pittillo and Smathers 1979).

BLRI is a temperate eastern park, and the climate is characterized by relatively high annual precipitation, high summer average humidity, and periodic snow events during winter months, often with persistent accumulations of snow at higher elevations. While some higher elevations receive plentiful rain, basins like Roanoke and Asheville are some of the driest areas east of the Mississippi River (Pittillo and Smathers 1979). Significant endemic populations and glacial relic resources of flora and fauna make the BLRI one of the NPS units with the highest biodiversity. Climatic variations along the Parkway create the conditions which enable the park's diverse resources to thrive.

Methods

For reporting year 2007, seven representative stations in relatively close proximity to the park boundary were selected for data analysis. These stations are geographically dispersed across the park, and have individual characteristics which make them desirable for reporting purposes. The reporting stations for North Carolina are: Davidson River RAWS - .86 miles SE of the park, Mt. Mitchell COOP - 1.5, miles N of the park, Blowing Rock COOP - in the park, and Laurel Springs COOP - 2.5 miles NW of Doughton Park. The reporting stations for Virginia are: Meadows of Dan COOP - 1 mile E of the park and 8 miles S of Rocky Knob, Roanoke Airport COOP - 5.6 miles W of the motor road, Holcombe Rock COOP - .5 miles S of the park and 2 miles W of the James River.

Results

Data Completeness, Quality and Period of Record

There are 31 present weather stations which operate within 10 km of the park (Davey et al. 2007). The seven representative stations were chosen for data analysis in this report because they are geographically dispersed across the park, and have individual characteristics which make them desirable for reporting purposes: 2 RAWS stations and 4 COOP stations outside the park, and one COOP station occurring within the park boundary (Figure 1). Averages for the COOP stations are usually represented by the Climatological Normal (30 year history 1971-2000), however, for stations less than 30 years old, the entire period of record is averaged. The RAWS station averages come from the complete period of record of 2003-2006 for Laurel Springs and 2004-2006 for Davidson River.

For 2007, data completeness was good, with all stations reporting more than 80 % of all potential measurements. Davidson River had missing precipitation data for all of January and February. A summary of data completeness is provided in Table 1.

Table 1. BLRI weather network data completeness (percentages) for 2007 (for complete station metadata and descriptions of the weather monitoring equipment see Davey et al., 2007).

Station	Temperature	Precipitation	Wind	Humidity	Solar Radiation
Davidson (RAWS)	100	80	NA	NA	100
Mt. Mitchell (COOP)	85	95	NA	NA	NA
Blowing Rock (COOP)	85	100	100	100	100
Laurel Springs (RAWS)	100	100	NA	NA	100
Meadows of Dan (COOP)	NA	95	NA	NA	NA
Roanoke Airport (COOP)	100	100	100	100	100
Holcombe Rock (COOP)	NA	95	NA	NA	NA

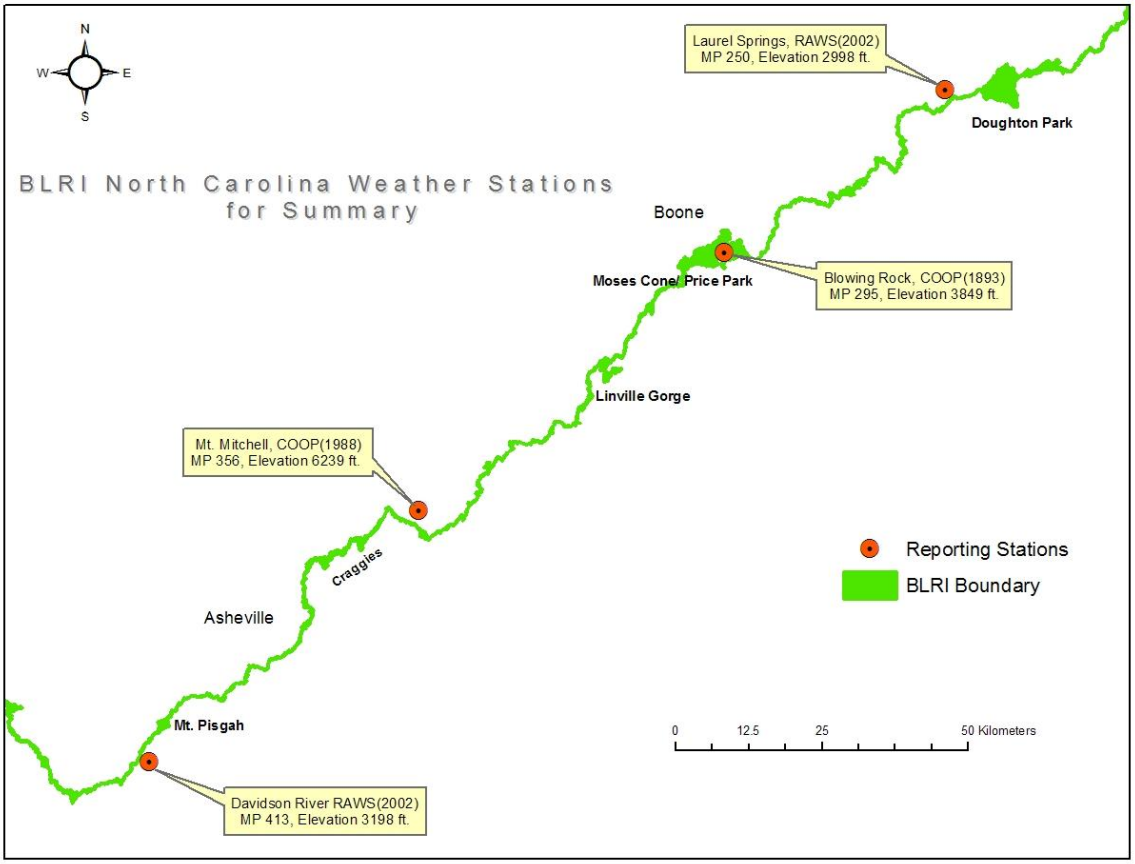


Figure 1. Map of North Carolina weather monitoring stations for reporting on the Blue Ridge Parkway.

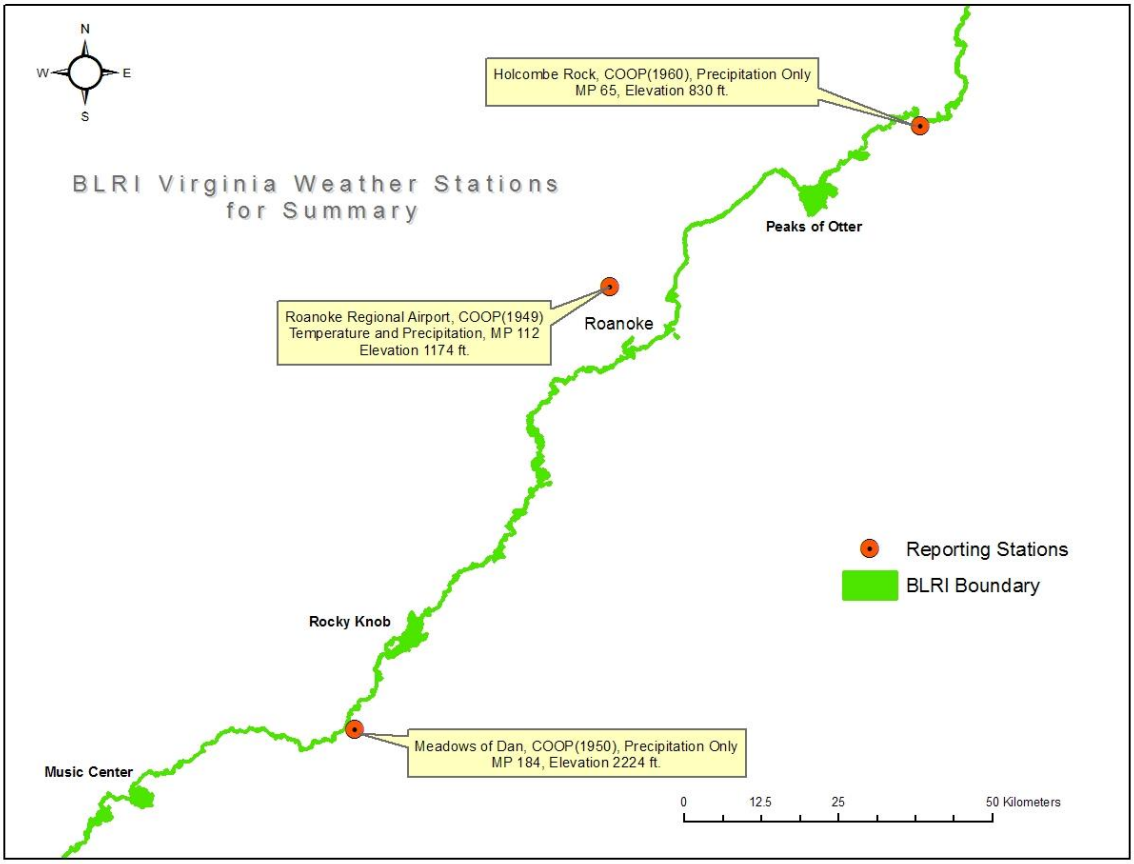


Figure 2. Map of Virginia weather monitoring stations for reporting on the Blue Ridge Parkway.

Temperature

Some stations along the BLRI have long records such as Blowing Rock, which has records for temperature extending back to 1893. On a national scale, temperature records indicate a fluctuating temperature cycle with a steadily increasing overall trend since 1976 (NOAA 2008). In 2007, data from Mt. Mitchell, Blowing Rock, and Laurel Springs showed average monthly temperatures more than 4 degrees F above average for March and August; the data record for Roanoke showed similar trends, with March reporting 6 degrees F above the average temperature (Tables 3,4,5,7). All reporting stations showed February as the only month with a significantly below average monthly temperature: -5.4, -5.8, -4.9 (Mt. Mitchell, Blowing Rock, and Roanoke respectively). Besides February, March, August, October and December, temperatures for the rest of the year were close to long term averages.

These increased temperatures were consistent with NOAA reports for the contiguous United States. March, in particular, at an average 48.1 F, was the second warmest March on record. Nationally, March was 5.6 degrees F warmer than the 20th century mean of 42.5 degrees F (NOAA 2008). Out of 113 years of weather record keeping NC experienced the 108th warmest year on record and VA the 106th respectively (NOAA 2008).

Table 2. 2007 monthly temperature summaries for Davidson River (degrees F).

Month	Mean	Departure from 3 yr. Average	Max.	Min.
Jan	48.35	-2.39	65	8
Feb	47.21	-1.61	64	10
Mar	61.42	4.70	77	20
Apr	62.43	-2.76	80	16
May	73.23	.82	82	29
Jun	78.6	.49	86	47
Jul	77.19	-2.31	85	47
Aug	84.58	2.87	91	51
Sep	76.53	1.21	84	33
Oct	67.45	1.20	79	22
Nov	57.6	-2.59	72	14
Dec	53.97	5.02	70	11

Table 3. 2007 monthly temperature summaries for Mt. Mitchell (degrees F).
X indicates missing days for monthly data.

Month	Mean Max.	Mean Min.	Mean	Departure from Normal 1971-2000	Highest	High Date	Lowest	Low Date
Jan	37.6	19.6	28.6	2.8	56	15	-7	29
Feb	31.3	12.9	22.1	-5.4	47	25	-2	16
Mar	48.6	30.8	39.7	6.1	65	26	6	5
Apr	49.1	28.8	39	-3	70	26	1	8
May	62.2	42.6	52.4	2.4	72	2	28	19
Jun	66.9X	49.3X	58.1X	1.1	74	9	42	15
Jul	65.4	51.2	58.3	-2.1	73	17	44	23
Aug	72.6	56.7	64.7	5.1	78	17	52	3
Sep	65.7	49.7	57.7	2.7	72	6	39	16
Oct	57.6	42.6	50.1	3.2	68	8	26	29
Nov	43.7X	27.5	35.6X	-2.1	57	1	11	17
Dec	41.7	26.7X	34.2X	4	57	12	5	17
Annual	53.5X	36.5X	45.0X	1.2	78	Aug	-7	Jan

Table 4. 2007 monthly temperature summaries for Blowing Rock (degrees F).
X indicates missing days for monthly data.

Month	Mean Max.	Mean Min.	Mean	Departure from Normal 1971-2000	Highest	High Date	Lowest	Low Date
Jan	41.2	22.4	31.8	1.8	58	15	1	29
Feb	35.6	18.2	26.9	-5.8	54	22	5	1
Mar	54.8X	34.9X	44.9X	4.7	74	26	14	4
Apr	56.6X	37.9X	47.3X	-1.3	74	27	12	7
May	69.5X	48.0X	58.8X	2.1	79	2	34	7
Jun	72.7	55.8	64.3	0.8	82	19	49	18
Jul	72.7	57.6	65.2	-2.3	82	10	50	23
Aug	80.1	62.7	71.4	5.2	86	17	57	2
Sep	72.4	52.9	62.7	2.3	80	5	39	16
Oct	62.1	47.4	54.8	4.5	76	8	26	30
Nov	49.7	31.1	40.4	-1.8	64	23	12	24
Dec	47.7	30.2	39	5.2	66	13	12	17
Annual	59.6X	41.6X	50.6X	1.3	86	Aug	1	Jan

Table 5. 2007 monthly temperature summaries for Laurel Springs (degrees F)

Month	Mean	Departure from 4 yr. Average	Max.	Min.
Jan	36.78	2.05	66	7
Feb	31.76	-3.52	58	9
Mar	48.5	4.71	78	21
Apr	50.46	-2.21	80	18
May	60.73	2.00	82	29
Jun	66.55	1.32	89	45
Jul	67.44	-1.67	86	47
Aug	73.03	5.73	92	51
Sep	63.73	0.03	87	35
Oct	56.52	3.95	84	24
Nov	42.56	-3.66	66	15
Dec	40.23	2.23	69	15

Table 6. 2007 monthly temperature summaries for Roanoke Airport (degrees F)

Month	Mean Max.	Mean Min.	Mean	Departure from Normal 1971-2000	Highest	High Date	Lowest	Low Date
Jan	50.2	32.2	41.2	5.4	72	14	15	29
Feb	43.3	25.1	34.2	-4.9	64	21	10	6
Mar	64.8	41.5	53.2	6	83	27	24	19
Apr	66.5	45.4	56	-0.1	88	30	28	8
May	79	56.1	67.6	3.5	92	1	37	7
Jun	84.6	64.2	74.4	2.5	95	18	55	7
Jul	85.5	65.8	75.7	-0.5	94	9	58	22
Aug	93.7	70.6	82.2	7.5	102	16	60	15
Sep	83.5	59.5	71.5	3.8	93	25	44	16
Oct	75	52.1	63.6	7	92	9	32	29
Nov	59.3	37.3	48.3	1	74	21	21	24
Dec	51.4	35.5	43.5	4.4	73	12	22	18
Annual	69.7	48.8	59.3	3	102	Aug	10	Feb

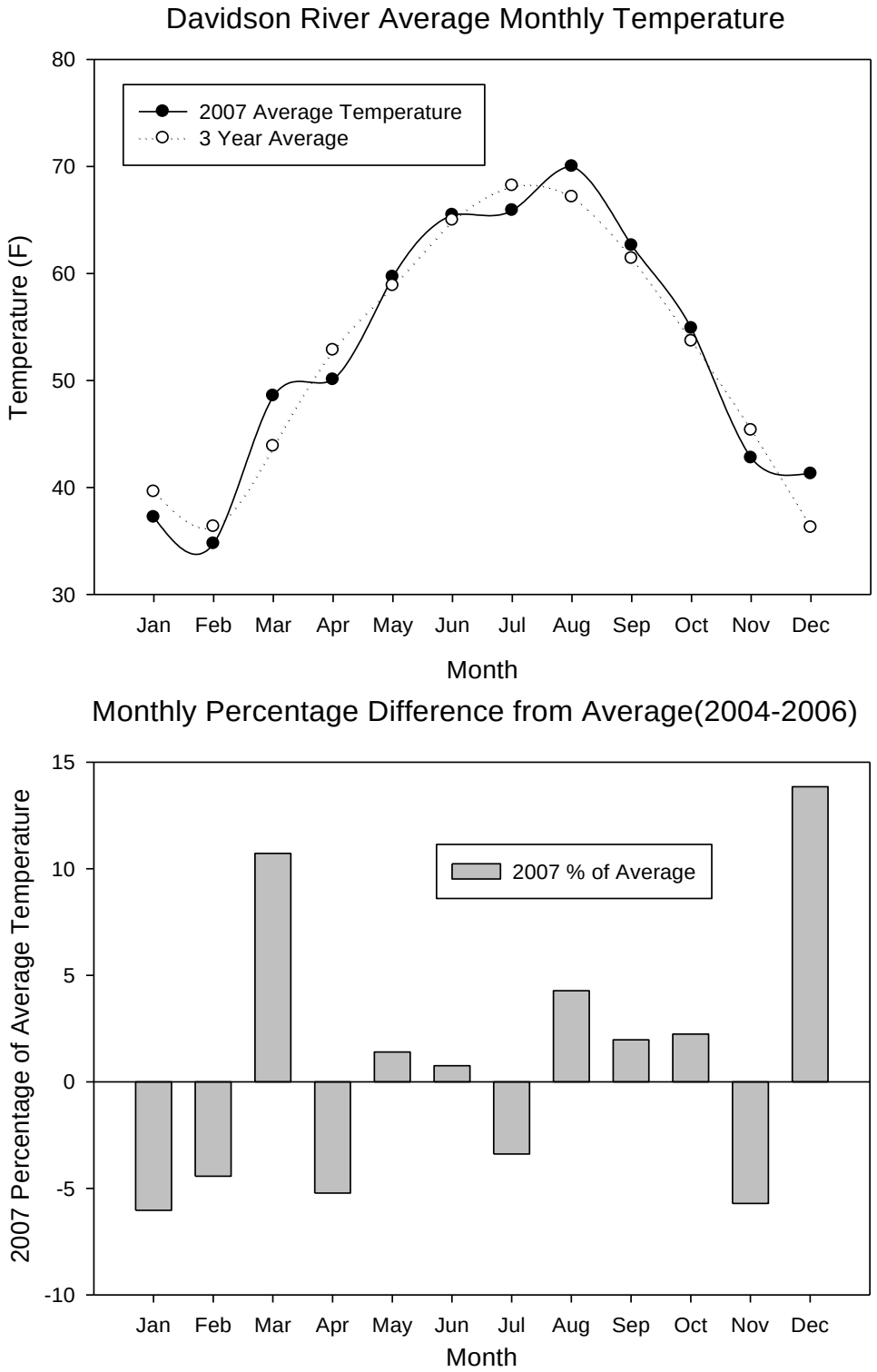


Figure 3. Comparison of 2007 average monthly temperatures with monthly averages for the period of record (2004-2006) for Davidson River: a) absolute differences and b) percentage differences.

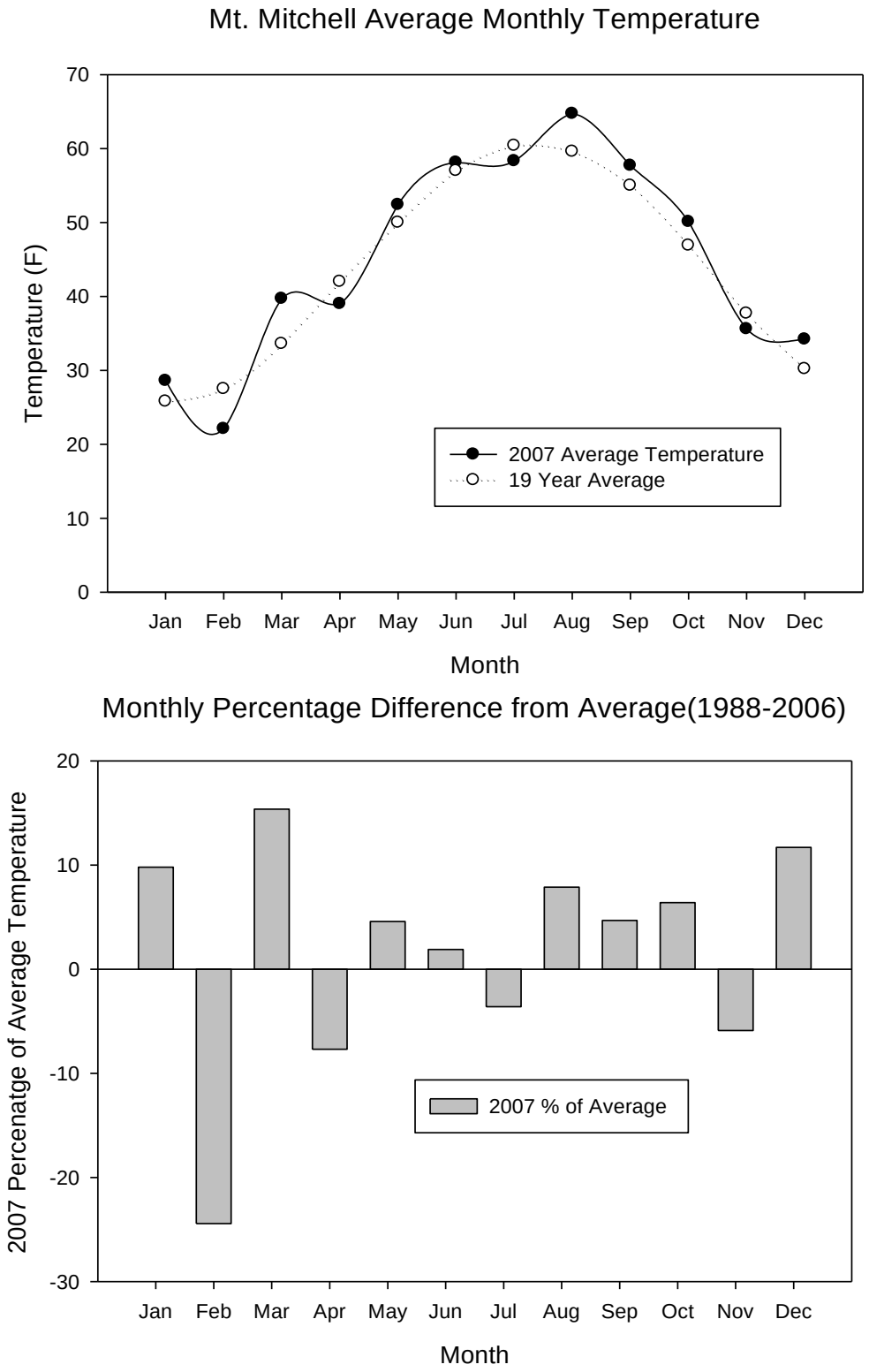


Figure 4. Comparison of 2007 average monthly temperatures with monthly averages for the period of record (1988-2006) for Mt. Mitchell: a) absolute differences and b) percentage differences.

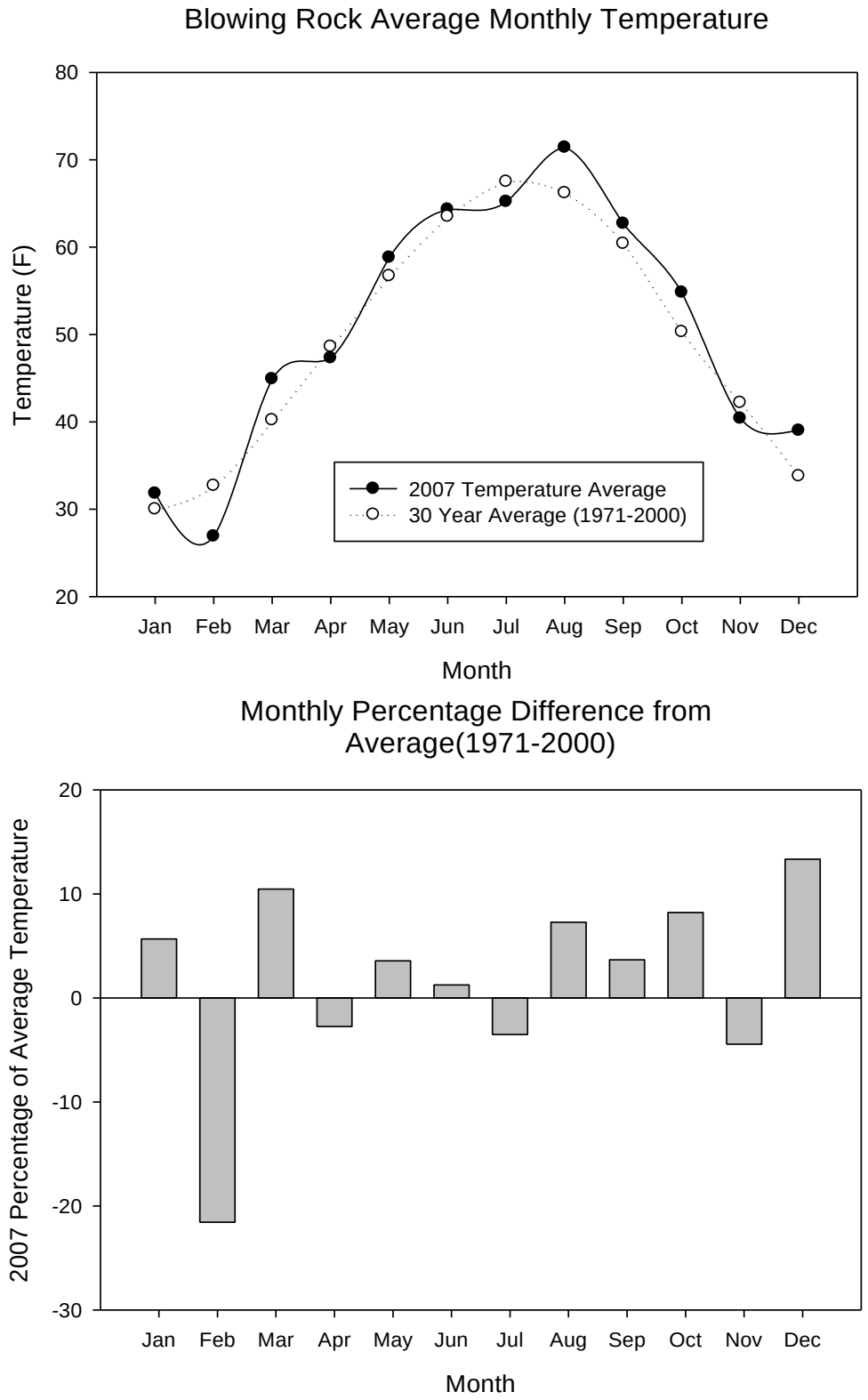
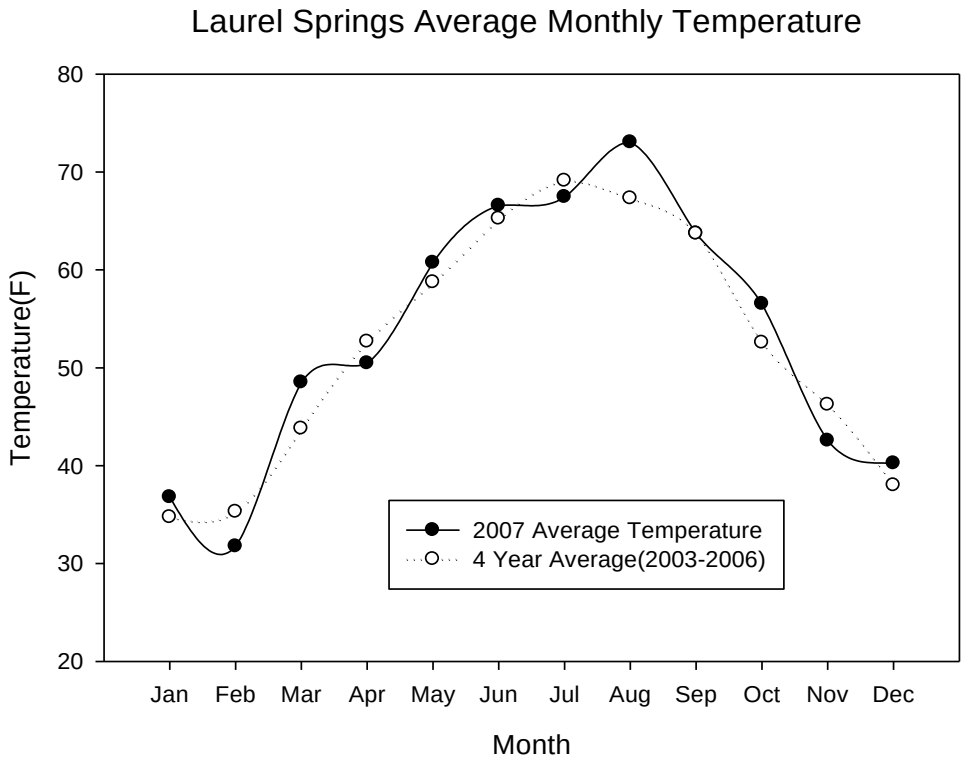


Figure 5. Comparison of 2007 average monthly temperatures with monthly averages for the Climatological Normal (1971-2000) for Blowing Rock: a) absolute differences and b) percentage differences.



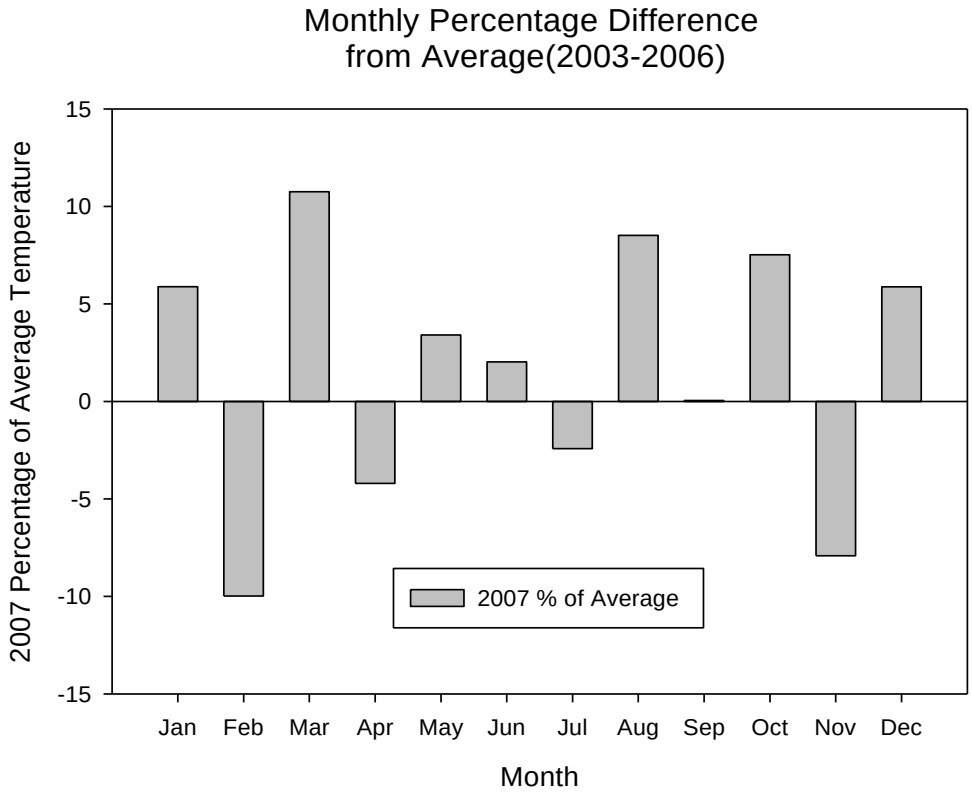


Figure 6. Comparison of 2007 average monthly temperatures with monthly averages for the period of record (2003-2006) for Laurel Springs: a) absolute differences and b) percentage differences.

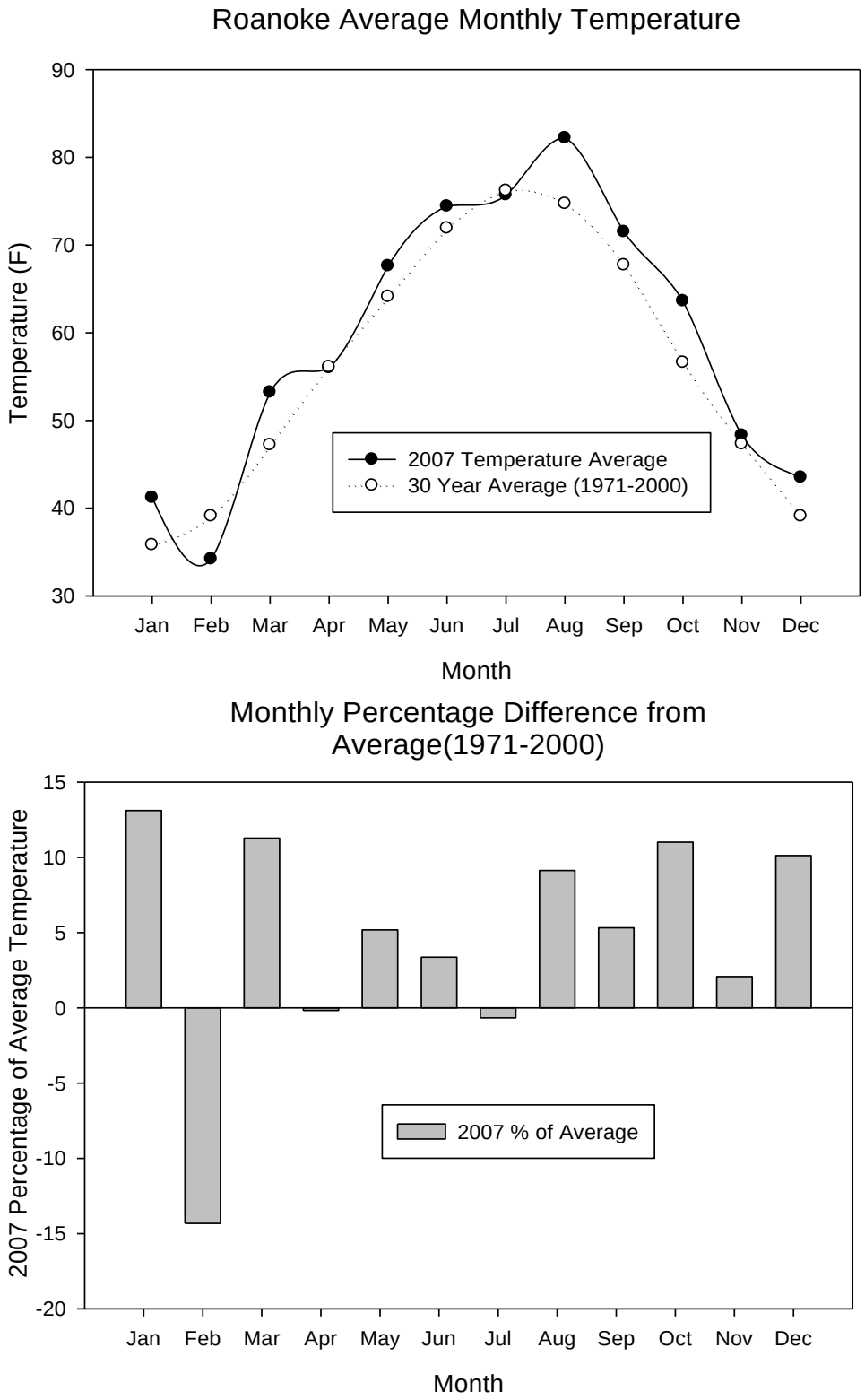


Figure 7. Comparison of 2007 average monthly temperatures with monthly averages for the Climatological Normal (1971-2000) for Roanoke Airport: a) absolute differences and b) percentage differences.

Precipitation

For the contiguous U.S. as a whole, seven months in 2007 were drier than average, and combined with unusually warm temperatures in the Southeast, drought conditions were exacerbated across much of the southeastern quadrant of the country. Out of 113 recorded years, NC recorded its **driest year** and VA recorded its 10th driest year, in 2007. In 2007, precipitation (as rainfall) near BLRI was spatially variable, though all stations recorded well below-average values. NC annual totals for Davidson River, Mt. Mitchell, Blowing Rock, and Laurel Springs were 36.78, 57.68, 44.5, and 27.81 inches, respectively (Table 7). VA annual totals for Meadows of Dan, Roanoke Airport, and Holcombe Rock were 48.13, 29.86, 37.49 inches, respectively (Table 8). The 2007 snow and sleet total for Mt. Mitchell was 34 inches, with missing days for January, March and December.

Table 7. Comparison of 2007 NC monthly precipitation totals with historical averages at Davidson River (3 years, 2004-2006), Mt. Mitchell (19 years, 1998-2006), Blowing Rock (30 years, 1971-2000), and Laurel Springs (4 years, 2003-2006). X indicates missing days for monthly data (all values in inches).

Month	Davidson 2007	Diff From Average	Mt. Mitchell 2007	Diff from Average	Blowing Rock 2007	Diff from Average	Laurel Springs 2007	Diff From Average
1	X	X	8.44X	1.44	6.09X	0.53	2.28	-0.73
2	X	X	1.93X	-3.48	1.26	-3.46	1.39	-1.54
3	0.46	-3.28	6.99	-0.94	6.56	-0.11	4.70	.86
4	3.14	-1.22	4.76	-0.58	2.04	-3.83	2.94	-2.89
5	3.77	-1.89	2.39	-3.54	1.36	-5.12	1.07	-1.16
6	5.75	-3.90	5.96	0.39	4.33	-2.15	1.96	-5.51
7	3.89	-7.05	7.48	0.78	4.63	-1.24	0.69	-4.71
8	3.28	.63	4.27	-3.12	1.44	-4.31	1.12	-4.07
9	1.84	-11.78	3.62	-1.25	2.28	-3.24	3.31	-3.35
10	5.31	4.26	5.91	0.81	8.73	3.95	2.62	-.25
11	3.03	-5.98	2.76	-3.6	1.68	-4.14	0.50	-5.91
12	6.31	0.89	3.17X	-3.73	4.1	-0.33	4.48	0.44
Totals	36.78X	-38.02	57.68X	-16.82	44.50X	-23.45	27.06	-28.81

Table 8. Comparison of 2007 VA monthly precipitation totals with historical averages at Meadows of Dan (30 years, 1971-2000), Roanoke (30 years, 1971-2000), Holcombe Rock (30 years, 1971-2000) (all values in inches). X indicates missing days for monthly data.

Month	Meadows of Dan 2007	Difference from Average	Roanoke 2007	Difference from Average	Holcombe Rock 2007	Difference from Average
1	4.94	0.35	2.4	-0.83	4.14X	0.68
2	2.21	-1.5	2.23	-0.85	3.01	-0.15
3	5.45	0.32	3.32	-0.52	5.29	1.26
4	4.47	-0.32	2.6	-1.01	4.73	1.11
5	2.45	-2.8	2.59	-1.65	2.03	-2.58
6	5.27	0.29	2.62	-1.06	3.75	0.14
7	2.48X	-2.42	3.22	-0.78	1.96	-2.66
8	3.06	-1.56	1.5	-2.24	1.86	-1.47
9	5.51	0.37	1.11	-2.74	1.57	-2.42
10	7.85	3.47	5.33	2.18	4.58	0.98
11	0.88	-3.49	0.18	-3.03	0.54	-2.94
12	3.56	-0.37	2.76	-0.1	4.03X	0.8
Totals	48.13X	-7.66	29.86	-12.63	37.49X	-7.25

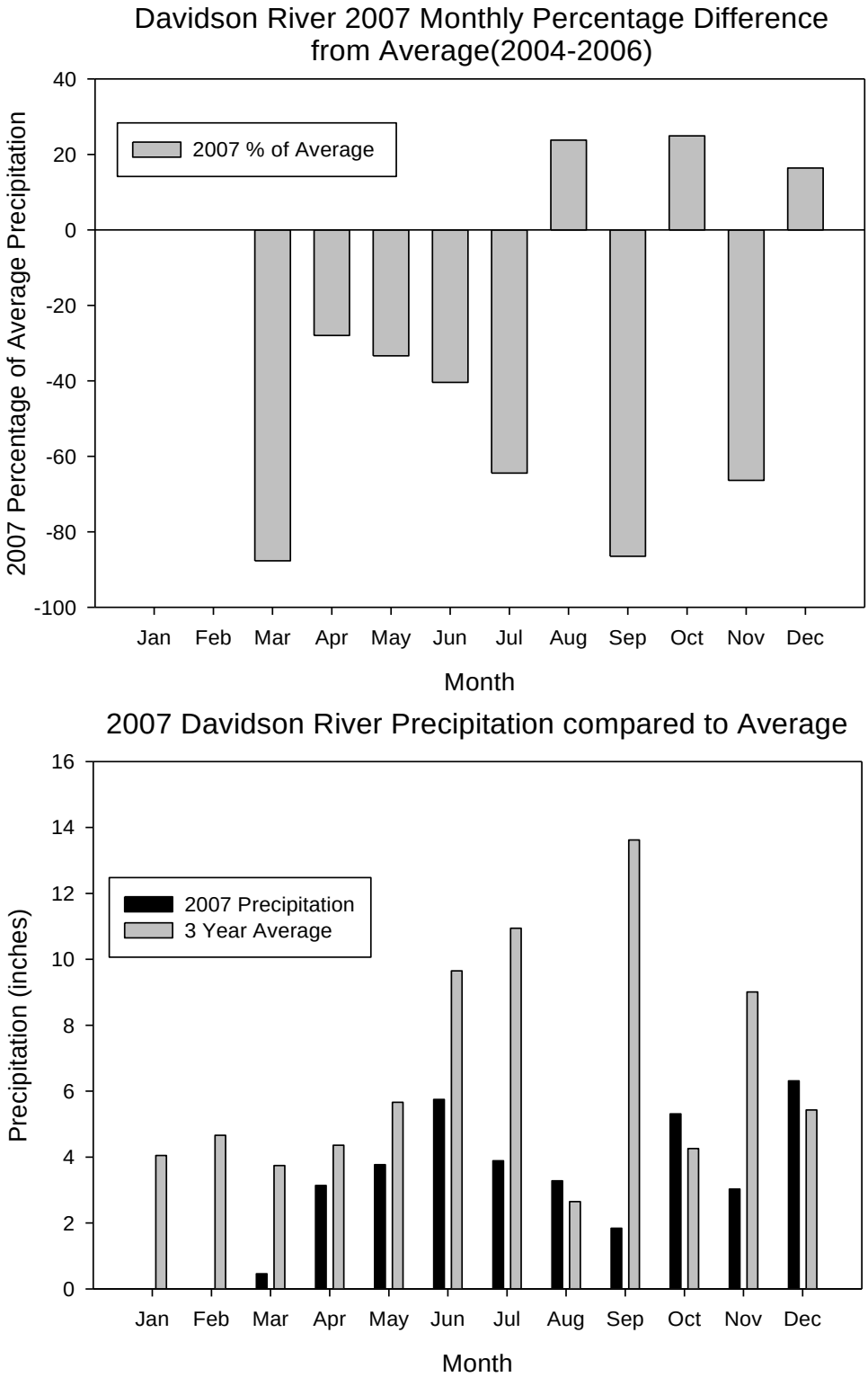


Figure 8. Comparison of 2007 average monthly precipitation with monthly averages for the period of record (2004-2006) for Davidson River: a) percentage differences and b) absolute differences.

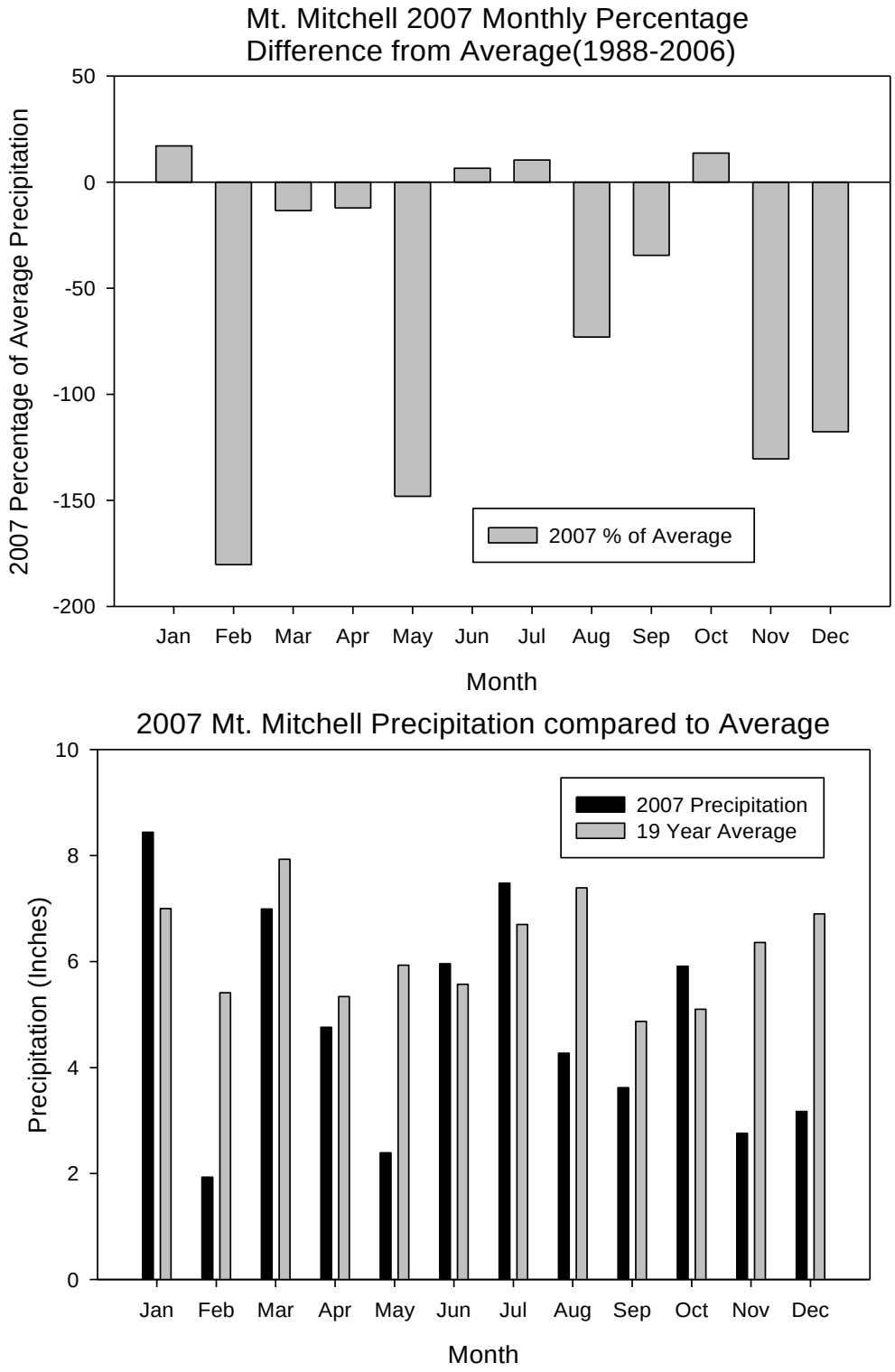


Figure 9. Comparison of 2007 average monthly precipitation with monthly averages for the period of record (1988-2006) for Mt. Mitchell: a) percentage differences and b) absolute differences.

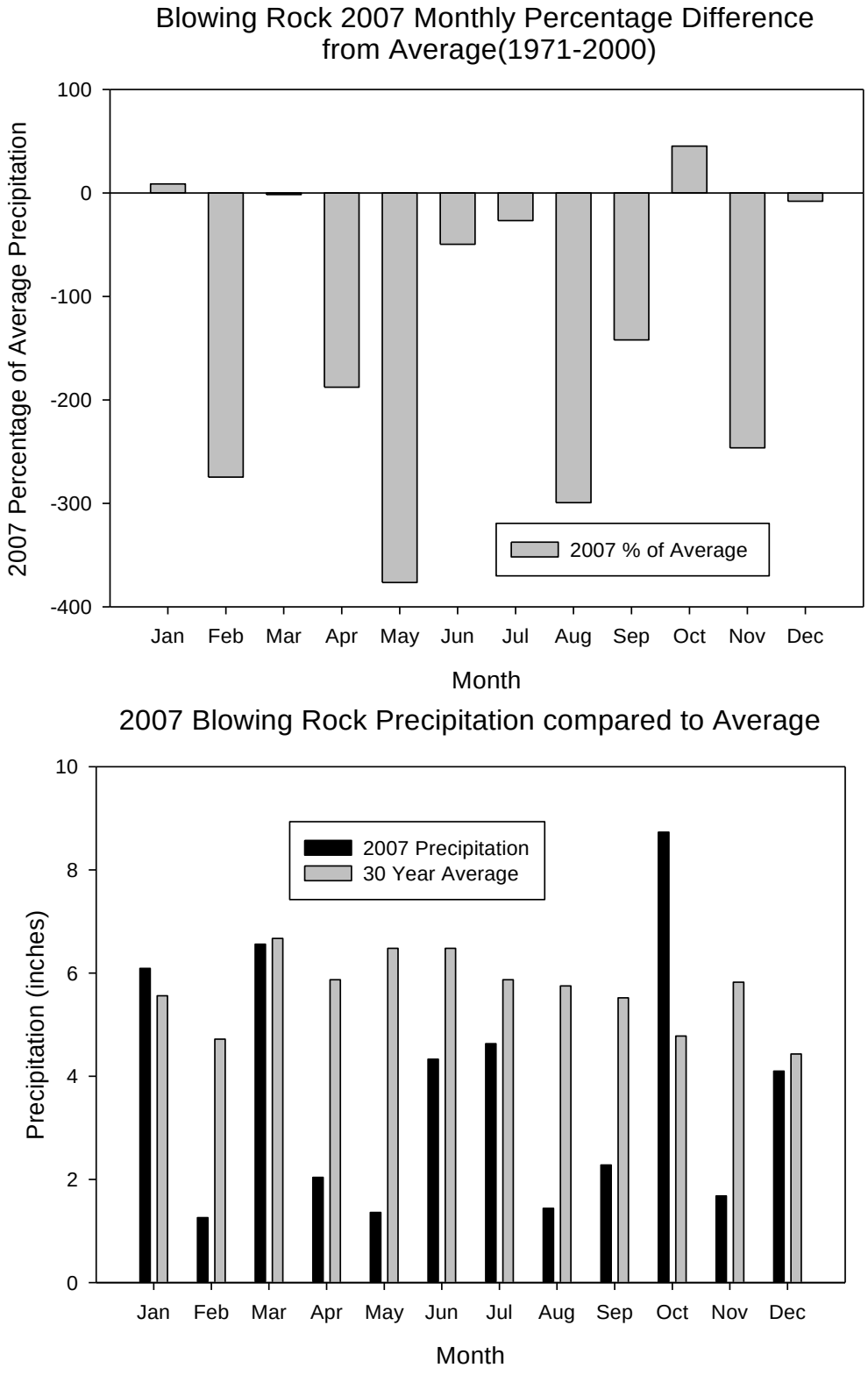
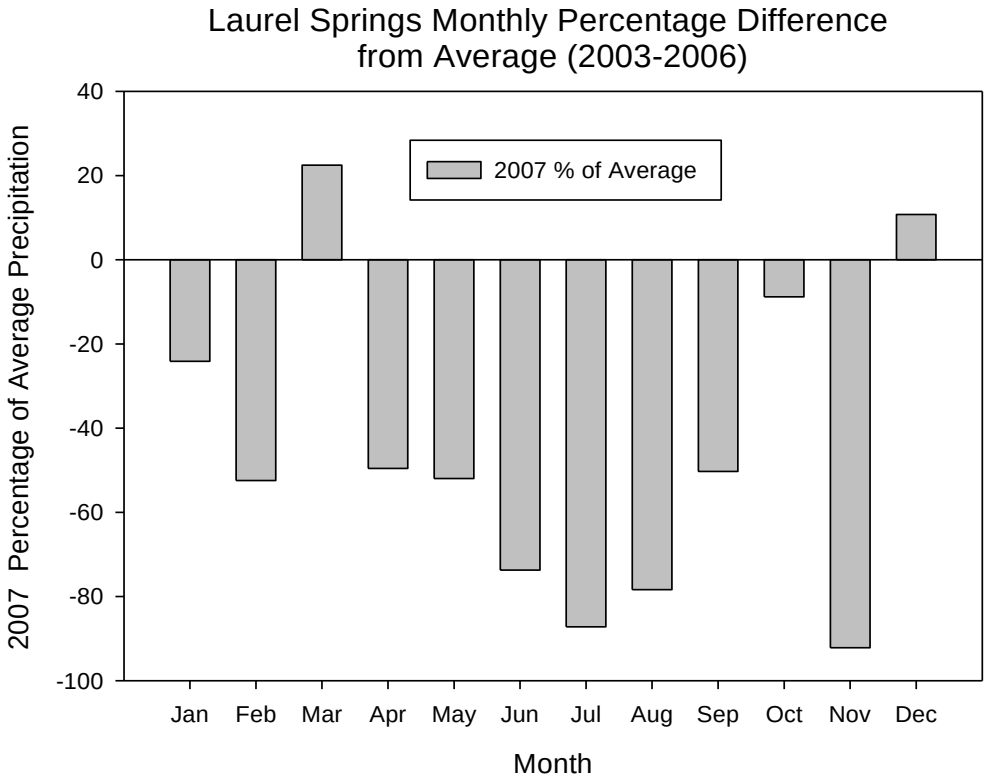


Figure 10. Comparison of 2007 average monthly precipitation with monthly averages for the period of record (1971-2000) for Blowing Rock: a) percentage differences and b) absolute differences.



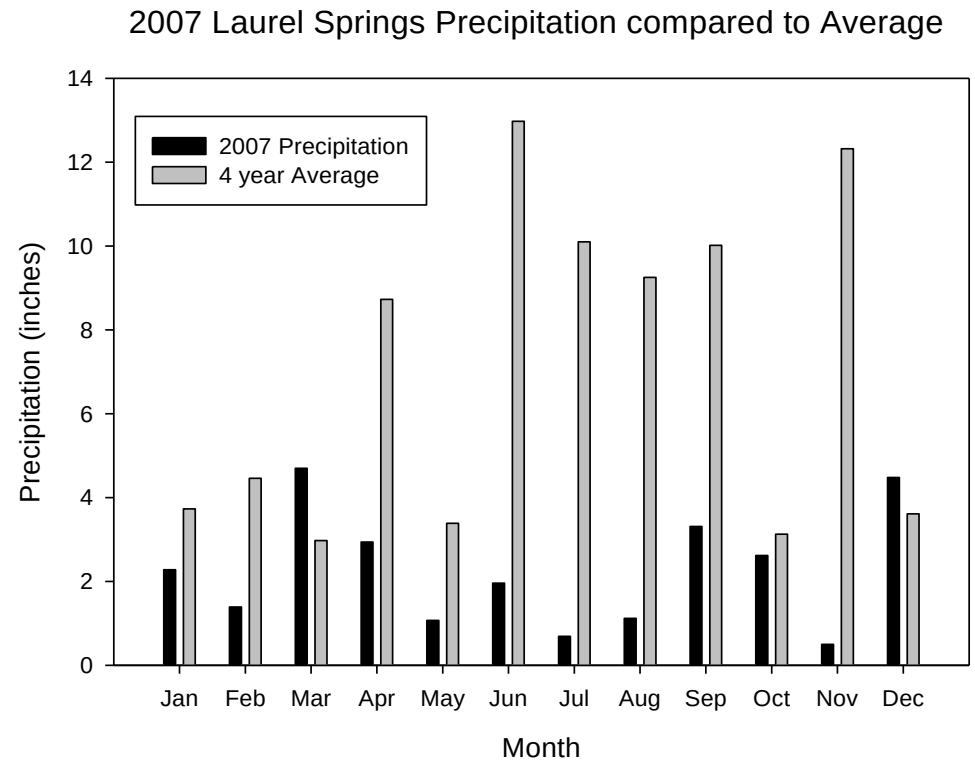


Figure 11. Comparison of 2007 average monthly precipitation with monthly averages for the period of record (2003-2006) for Laurel Springs: a) percentage differences and b) absolute differences.

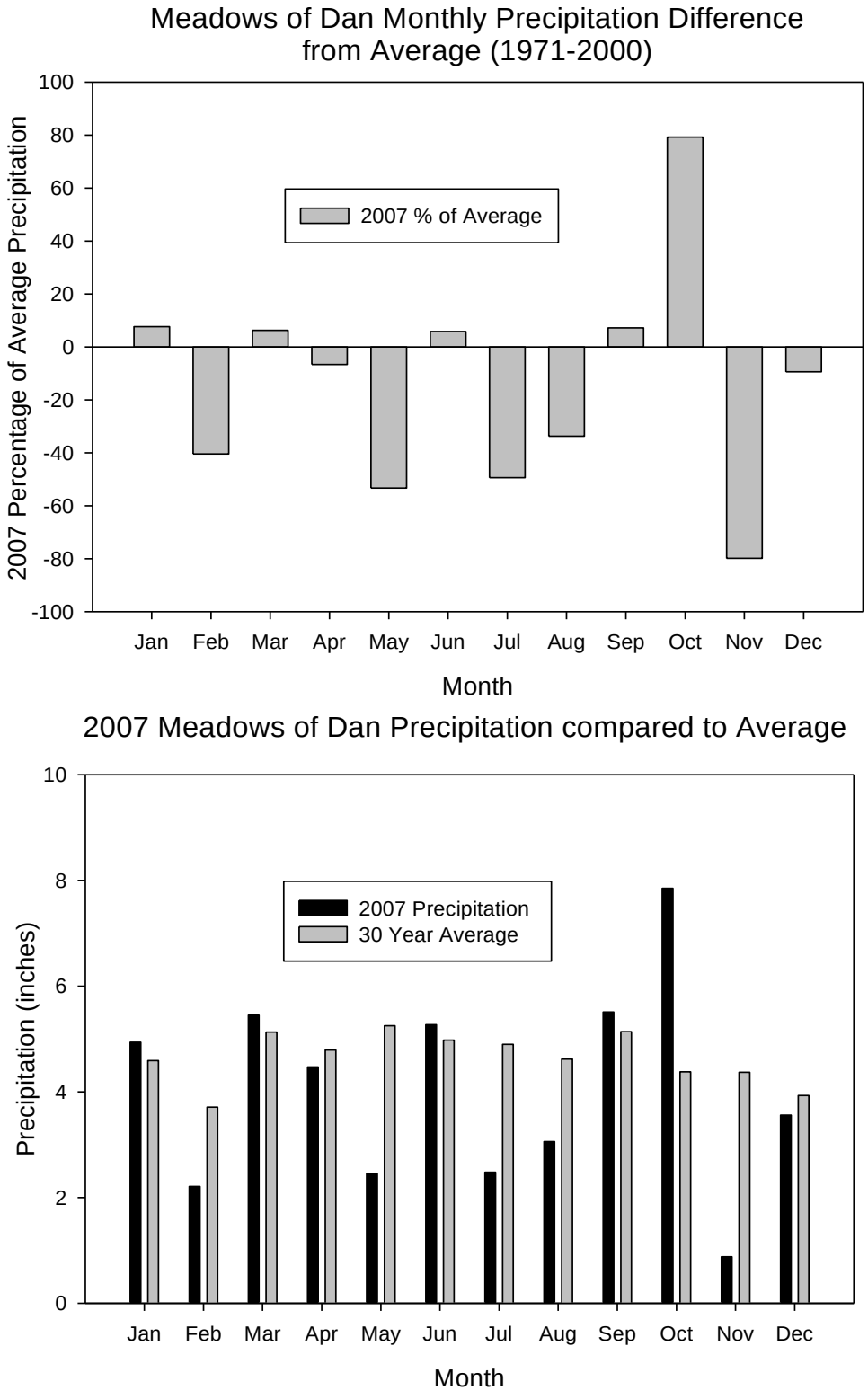
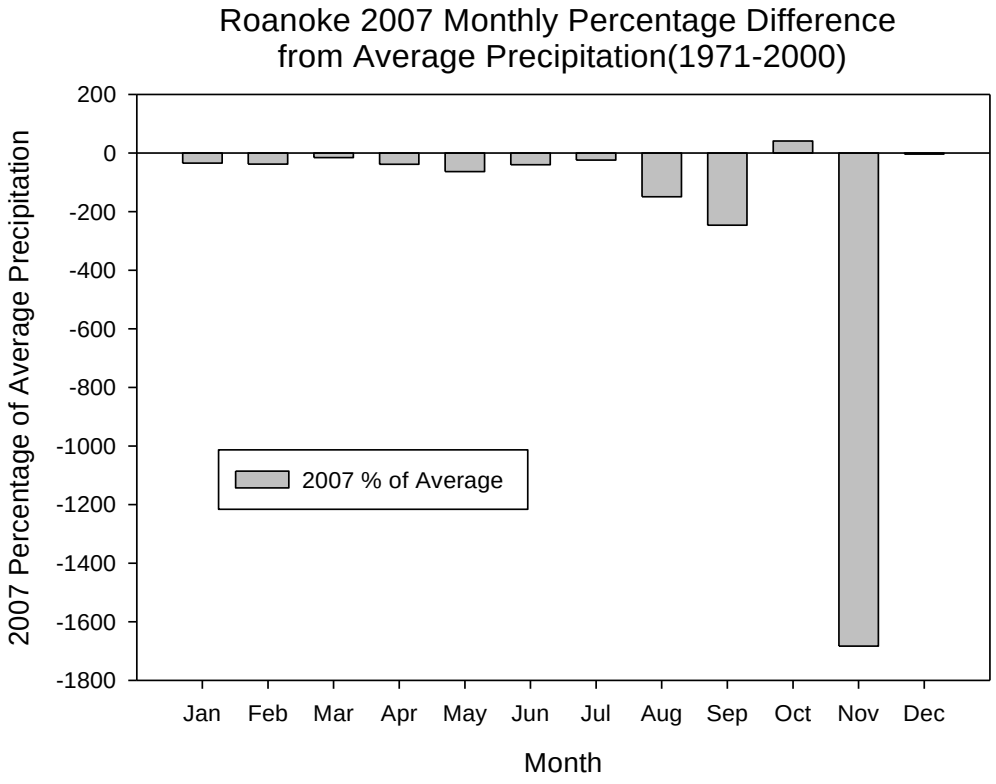


Figure 12. Comparison of 2007 average monthly precipitation with monthly averages for the Climatological Normal (1971-2000) for Meadows of Dan: a) percentage differences and b) absolute differences.



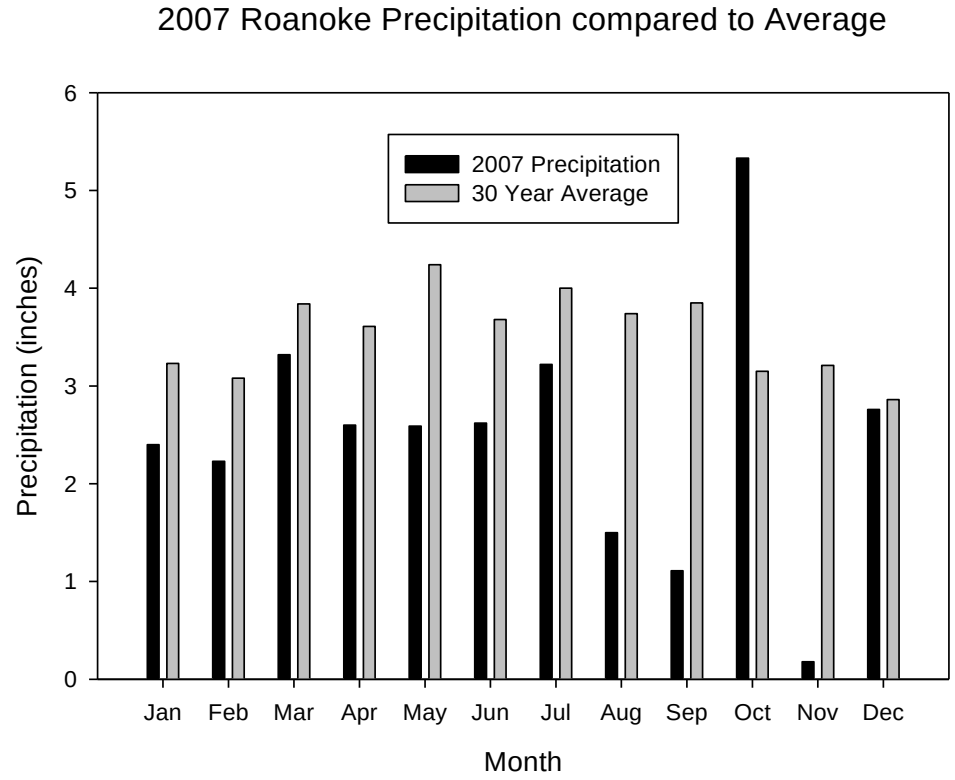


Figure 13. Comparison of 2007 average monthly precipitation with monthly averages for the Climatological Normal (1971-2000) for Roanoke Airport: a) percentage differences and b) absolute differences.

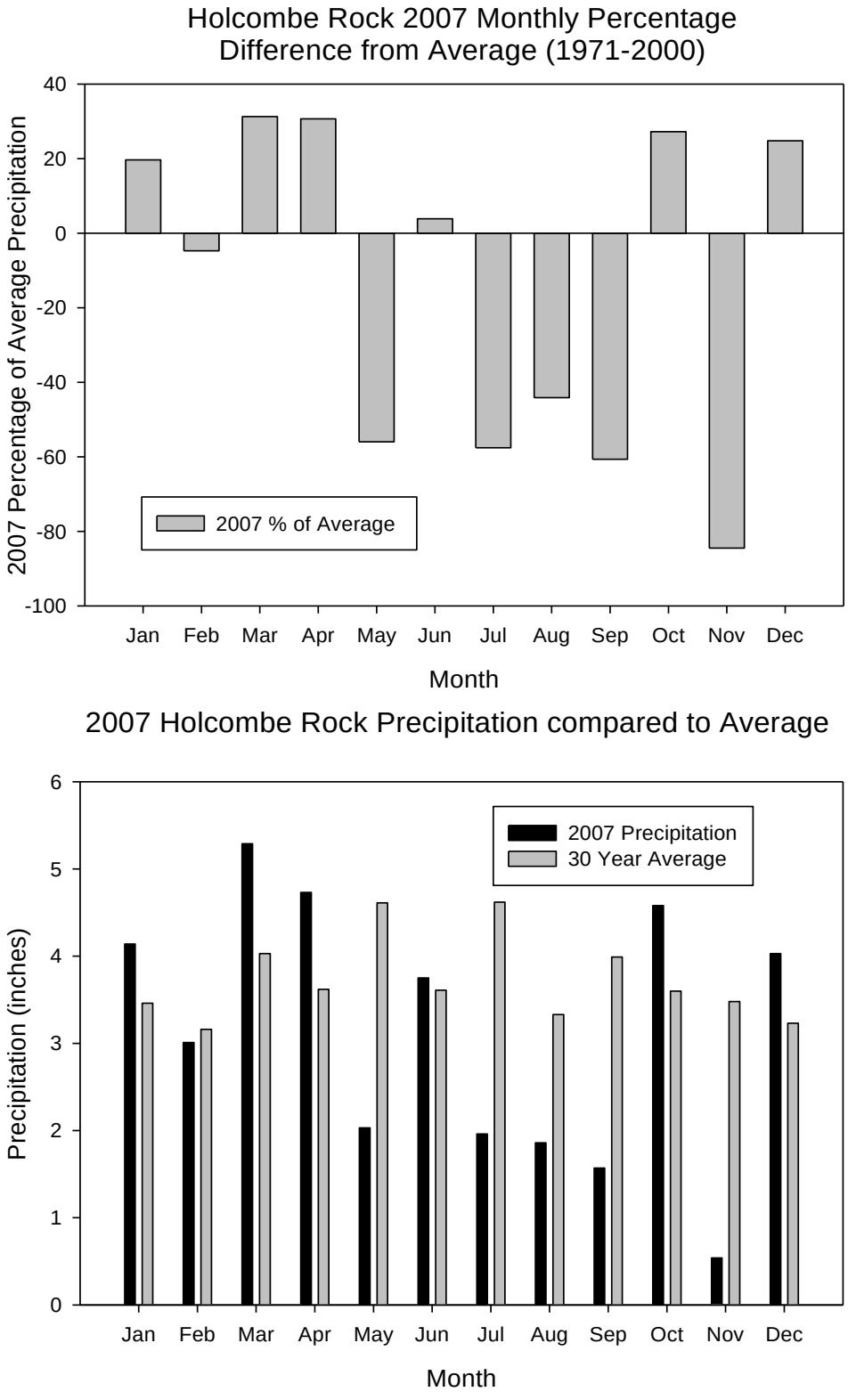


Figure 14. Comparison of 2007 average monthly precipitation with monthly averages for the Climatological Normal (1971-2000) for Holcombe Rock: a) percentage differences and b) absolute differences.

Notes

Many other stations occur nearby the BLRI boundary, most notably: Grandfather Mountain, Buena Vista, and the Asheville Regional Airport. A more detailed list of nearby stations is summarized in the APHN Weather and Climate Inventory (Davey et al. 2007).
For government employees, a username and password is needed to obtain free COOP data. The National Climatic Data Center (http://www.ncdc.noaa.gov/oa/ncdc.html) and the Southeast Regional Climate Center (http://www.sercc.com/) are good places to find answers to technical questions about COOP climate data, while the Western Regional Climate Center (http://www.wrcc.dri.edu/) is a good place to find answers about RAWS data.

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